







IMPACT OF THE COVID-19 PANDEMIC ON SPINE SURGERY IN A TERTIARY HEALTH CARE INSTITUTION

IMPACTO DA PANDEMIA DE COVID-19 NAS CIRURGIAS DE COLUNA EM UMA INSTITUIÇÃO TERCIÁRIA DE SAÚDE

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ABSTRACT

Objectives: To assess postoperative complications, including COVID-19 infection, among patients undergoing surgeries at a tertiary institution during the pandemic, and to develop a local epidemiological profile of spine surgery patients. **Methods:** Retrospective descriptive study of all patients who underwent spine surgery between March 2020 and 14 January 2021 in a tertiary institution in Latin America. All patients who underwent spine surgery were included, without age restrictions. The main outcomes were postoperative complications, including COVID-19 infection. **Results:** 74 patients were included in the study, 43 males and 31 females. The average age was 49.6 years. The mean duration of hospitalization was 11.5 days. Urgent surgeries were performed in 60.81% of cases. During hospitalization, only 5 of 74 patients were diagnosed with COVID-19, and only 1 patient had pulmonary involvement estimated to be greater than 50%. On average, 1.9 surgical debridements were required after postoperative surgical site infection. **Conclusions:** During the hospitalization period, only 6.7% of patients were diagnosed with COVID-19 infection. The COVID-19 infection death rate was 1 in 5 cases. The postoperative surgical site infection rate was 10.8%, similar to the level before the pandemic. **Level of Evidence IV; Observational retrospective descriptive study.**

Keywords: COVID-19. Pandemic, COVID-19. Surgical Wound Infection. Spine. Surgery.

RESUMO

Objetivos: Avaliar complicações pós-cirúrgicas, incluindo infecções por COVID-19, entre pacientes cirúrgicos numa instituição terciária de saúde durante a pandemia, e desenvolver um perfil epidemiológico local de pacientes de cirurgias da coluna. **Métodos:** estudo descritivo e retrospectivo de todos os pacientes que passaram por cirurgias da coluna entre março de 2020 e 14 de janeiro de 2021, numa instituição terciária na América Latina. Todos os pacientes que passaram por cirurgias na coluna foram incluídos, sem restrição de idade. Os principais resultados foram complicações pós-cirúrgicas, incluindo a infecção por COVID-19. **Resultados:** 74 pacientes foram incluídos no estudo, 43 do sexo masculino e 31 do feminino. A média de idade foi de 49.6 anos. A duração média da hospitalização foi de 11.5 dias. Cirurgias urgentes foram realizadas em 60.81% dos casos. Durante a hospitalização, apenas 5 dos 74 pacientes foram diagnosticados com COVID-19, e apenas 1 deles teve envolvimento pulmonar estimado em mais que 50%. Em média, 1,9 desbridamentos cirúrgicos foram necessários após infecção do sítio cirúrgico. **Conclusões:** Durante o período de hospitalização, apenas 6,37% dos pacientes foram diagnosticados com infecção por COVID-19. A taxa de mortes devido à infecção por COVID-19 foi de 1 em 5. Infecções do sítio cirúrgico atingiram uma taxa de 10.8%, nível similar àquele prévio à pandemia. **Nível de evidência IV; Estudo observacional retrospectivo descritivo.**

Descritores: COVID-19. Pandemia COVID-19. Infecção da Ferida Cirúrgica. Coluna vertebral. Cirurgia.

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INTRODUCTION

An acute respiratory disease caused by the new SARS-CoV-2 (COVID-19) has spread from China to other countries and has attracted attention worldwide. On January 30, 2020, the World Health Organization officially declared the COVID-19 pandemic. The clinical symptoms include fever, cough, fatigue, and gastrointestinal

symptoms. Elderly people are the most vulnerable to infection and severe complications. However, to date, there is no specific treatment available for the disease.¹

Several individuals have spinal problems, many of whom require an urgent surgery to minimize or prevent neurological damage. However, in the current pandemic, the actual level of risk of exposing

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the patient to the hospital environment and the impact of operating on a patient infected with COVID-19 are not known.

Postoperative infection alone has a substantial negative effect on patient survival, quality of life and the health system due to the high cost of managing postoperative complications.²⁻⁶

However, when a patient infected with COVID-19 is undergoing surgery, there is no way to estimate the possible risk of infection or other negative outcomes, as there are no current data in the literature. Thus, determining the epidemiological profile of patients undergoing urgent surgeries during the pandemic, including the COVID-19 infection rate, is essential to propose measures to minimize the risks. Thus, the present study aimed to assess postoperative complications, including COVID-19 infection, among patients undergoing surgeries at a tertiary institution during the pandemic and develop a local epidemiological profile of spine surgical patients.

METHODS

A retrospective descriptive study of all patients who underwent spine surgery between March 2020 and January (until day 14) 2021. All patients who underwent spine surgery were included, without age restrictions.

The following measures were used for standardization: age measured in years, sex (male or female), etiology of the underlying pathology involving the patient's spine, and length of hospitalization measured in days.

The main outcomes were postoperative complications, including COVID-19 infection.

The other outcomes included postoperative infections; the number of surgical debridements required after the infection; American Society of Anesthesiologists and Frankel scores; comorbidities; whether emergent or urgent surgery was needed; deaths during hospitalization; smoking status; preoperative hemoglobin, leukocyte, platelet, and lymphocyte counts; and postoperative hemoglobin and platelet counts.

The data were stored in a spreadsheet in Excel 2010 for Windows for descriptive analysis. Informed consent was not required, as contact with or the identification of patients was not required.

Protocol adopted at the institution during the pandemic:

- Asymptomatic patients were kept in a COVID-19-free environment, wore a surgical mask for the first five days and were monitored for the appearance of symptoms. Swabs for COVID-19 were collected on admission; if the patient had symptoms, he or she was transferred to the hospital's COVID-19 sector, and PCR was performed to diagnose the infection.

- Symptomatic patients were transferred to the inpatient COVID-19 sector, and PCR was performed.

- Indications for admission to the intensive care unit were based on the clinical indication of severity.

- All elective spine surgeries cases had a PCR exam performed 72 hours in advance; if the results were positive, it was necessary to wait 30 days and conduct a new exam before the patient could undergo the surgical procedure.

- Acute respiratory distress syndrome was defined as respiratory frequency greater than 24 breaths per minute and/or oxygen saturation less than 95% (room air).

Risk groups were defined as elderly adults, people with chronic disease (i.e., cardiopathy, diabetes, cancer, hypertension), immunosuppression, or obesity.

The study was approved by the institutional review board. Informed consent was not required.

RESULTS

A total of 74 patients met the inclusion criteria and were included in the study, including 43 males and 31 females. The average age was 49.6 years. The mean length of hospitalization was 11.5 days. Urgent surgeries were performed on 60.81% of patients.

Of the surgical procedures performed, only 2 lasted more than 4 hours. The comorbidities and the Frankel and ASA scores are shown in (Table 1). A total of 29.73% of the patients were smokers. During the hospitalization period, only 5 of the 74 patients were diagnosed with COVID-19, and only 1 patient had pulmonary involvement estimated to be greater than 50%. The COVID-19 death rate was 1 in 5 cases (20%).

The postoperative surgical site infection rate was 10.8% (8 cases). On average, 1.9 surgical debridements were required.

The diagnoses and surgeries performed are shown in (Tables 2 and 3). Other postoperative complications observed in the study were urinary tract infection (5 cases), acute renal failure (1 case), subarachnoid hemorrhage (1 case), cerebrospinal fluid fistula (1 case), meningoencephalitis (1 case), and herniated disc recurrence (1 case).

(Table 4) shows the mean values of the hemoglobin, platelet, leukocyte and lymphocyte counts preoperatively as well as the hemoglobin and platelet counts postoperatively.

Table 1. Comorbidities and Frankel and ASA Scales.

ASA	Number	
I	57	77.0%
II	13	17.6%
III	4	5.4%
Frankel		
A	7	9.5%
B	2	2.7%
C	11	14.9%
D	10	13.5%
E	44	59.4%
Comorbidities		
Hypertension	19	54.3%
Diabetes Mellitus	11	31.5%
Hashimoto Thyroiditis	3	8.6%
Fibromyalgia	1	2.8%
Rheumatoid Arthritis	1	2.8%

Table 2. Spinal Pathologies.

	Number of cases	
Fracture and/or vertebral dislocation	30	40.5%
Degenerative disc disease	17	23.0%
Cervical stenosis with myelopathy	11	14.9%
Lumbar stenosis	9	12.2%
Cauda equina syndrome	3	4.0%
Cervical traumatic disc herniation	3	4.0%
Lumbar spondylolisthesis	1	1.4%

Table 3. Surgeries Performed.

	Number of cases	
Thoracolumbar arthrodesis +/- decompression	25	33.7%
Lumbar decompression + discectomy	14	18.9%
Cervical discectomy + arthrodesis, anterior approach	12	16.2%
Decompression + cervical arthrodesis, posterior approach	8	10.8%
Lumbar decompression without instrumentation	7	9.5%
Halo cervical traction	4	5.4%
Odontoid fixation	2	2.7%
Cervical decompression, combined approach	1	1.4%
Cervical open-door laminoplasty	1	1.4%

Table 4. Laboratory Values.

Mean hemoglobin level preoperatively	13.45 mg/dL
Mean hemoglobin level postoperatively	11.57 mg/dL
Mean platelet count preoperatively	260.830/mcl
Mean platelet count postoperatively	245.220/mcl
Mean leukocyte count preoperatively	9.390/mcl
Mean lymphocyte count preoperatively	1960/mcl

DISCUSSION

The COVID-19 pandemic has profoundly altered the delivery and scheduling of surgeries in many different institutions worldwide, due to patients' and health care providers' fear of contracting the virus, the difficulty of accessing institutions capable of dealing with a large volume of patients and the various difficulties in isolating patients appropriately to hinder the spread of the virus, especially in underdeveloped countries. Thus, many patients who require urgent surgical procedures arrive late to the health care institution or do not even seek a specialized service for diagnostic assessments and treatment.^{7,8}

Specific surgical procedures in orthopedic spine surgery are often urgently needed to minimize sequelae or prevent neurological damage, as well as to restore mechanical stability and relieve patients' pain. Thus, an adequate systematization of patient care from the time of entry into the emergency room until hospital discharge must be well established to hinder the spread of COVID-19. In the present study, the rate of COVID-19 infections diagnosed in patients who were hospitalized for surgical procedures was 6.7% (5 cases), and the associated mortality rate was 20%.

In the institution, the internationally recommended standard safety protocols were performed when patients who were suspected or confirmed to have COVID-19 infection were treated.^{9,10} For this purpose, reverse transcriptase-polymerase chain reaction (RT-PCR) was performed, and chest computed tomography (CT) scans were performed to diagnose or exclude infection in patients who were suspecting of having infection and planning to undergo surgery. N95 masks and other individual protective equipment were used, as recommended by the local hospital infection control services, and the patients were isolated in a private room with negative pressure when a COVID-19 diagnosis was suspected or confirmed. All suspected or confirmed cases were reported early to minimize further spread of the virus. This strategy was successful as the contraction rate in the department was maintained at an acceptable level (less than 10%). All indications for surgery during the pandemic period followed the recommendations of the North American Spine Society,¹¹ the American College of Surgeons,¹² and the document signed by the Brazilian Spine Society, the Brazilian Society of Neurosurgery, and the Brazilian Society of Orthopedics and Traumatology.^{13,14}

It should be noted that the prevalence of smoking was high among the patients in the study (29.73%), and smoking is known to impair lung function and the prognosis if an infection develops, especially pulmonary infections such as that caused by COVID-19.¹⁵ Among

the comorbidities observed in the study, there were no divergent findings regarding the prevalence of chronic diseases in the population, and hypertension was the most prevalent chronic disease, followed by diabetes mellitus.¹⁶

The most common pathologies addressed were fracture and/or dislocation (40.5%), degenerative disc disease (23%) and cervical stenosis (14.9%). The following surgical procedures were among the most common: thoracolumbar arthrodesis with or without decompression (33.7%), lumbar decompression + discectomy (18.9%) and cervical discectomy. This finding is in agreement with the prevalence of vertebral pathologies observed in the general population and their main proposed treatments.¹⁷⁻¹⁹ The other complications that occurred in the study include urinary tract infection (5 cases), acute renal failure, subarachnoid hemorrhage, meningoencephalitis and herniated disc recurrence (1 case each). The ASA score was not relevant since more than 90% of the patients were healthy (ASA I) or had well-controlled comorbidities (ASA II). Regarding the Frankel scale, which evaluates neurological function, a significant number of patients had neurological deficits (Frankel A, B, C). This finding can be justified by the severity of the traumas addressed and sometimes by the difficulty that patients have in accessing specialized health services, as they often arrive to the institution after their condition has progressed considerably. Regarding the findings of the pre- and postoperative laboratory examinations, no significant changes were found. This finding can also be explained by the fact that the vast majority of patients were healthy or had well-controlled comorbidities.

Limitations of the study include the fact that it was a retrospective study without comparison of or subdivision by specific pathologies. During the pandemic, the complication rates were within the expected range for urgent or emergent surgeries. In addition, although the vast majority of procedures were performed urgently, the protocols followed at the institution to combat COVID-19 appear to have been effective as they kept spine surgeries safe from contamination with the virus and other general complications. It is worth mentioning that in urgent cases, it is often not possible to perform ideal patient preparation; nonetheless, the management of cases seems to have been satisfactory. This fact warrants further investigation to elucidate the real benefit of the protocols followed by the institution and encourage others to follow well-structured protocols to prevent virus contamination for a successful outcome.

Data should be collected continuously to improve the institution's ability to plan and provide care, and data on more cases will help outline the epidemiological findings in more detail, which can improve the quality of education provided to residents and spine surgery fellows.

CONCLUSIONS

During the hospitalization period, only 5 of the 74 patients were diagnosed with COVID-19 infection. The COVID-19 infection death rate was 1 in 5 cases. The postoperative surgical site infection rate was 10.8%, which was similar to the level before the pandemic.

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